U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1043

STRAWBERRY VARIETIES

IN THE UNITED STATES

THIS BULLETIN is intended as an aid to both commercial and amateur strawberry growers in the selection of varieties best suited to their needs and conditions. The information is based largely on the experience of successful growers in practically every important commercial strawberry-producing district throughout the country; but the results of experiment-station tests, the experience of commercial canners and by-product manufacturers, the preferences of amateur fruit gardeners, and the conclusions resulting from wide personal observation have also been used in making up the variety lists which are given for different sections and regions. Varieties having particular value for different purposes are grouped under appropriate heads.

New varieties are being constantly introduced to the trade. Nearly all of them possess no special value as compared with others already more or less well known to the trade, and most of them soon disappear from the nurseryman's lists or at best remain of only local importance. But from time to time a new variety is introduced which has sufficient value to give it a somewhat permanent place in the strawberry industry, and as its merits become more and more widely known it is planted accordingly.

For these reasons no list of varieties recommended for planting in any section can be regarded as permanent; it is subject to change as valuable new introductions of little-known varieties of value come into prominence and their merits and range of adaptability become known.

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STRAWBERRY VARIETIES IN THE UNITED STATES[1]

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TESTING VARIETIES

THE TESTING of varieties of strawberries has long been carried on by private individuals, nurserymen, and experiment stations. Where such tests have been made on soils and under conditions typical of considerable areas they have been valuable. To be of greatest value, however, the tests must be continued for several years, because conditions vary from season to season and the strawberry responds quickly to changes in weather and soil. The varieties selected for extensive commercial growing should be those which, after several years' trial, show the best average record for productiveness and ability to meet commercial demands.

The recommendations made in this bulletin are based upon the experience of strawberry growers, nurserymen, and experiment-station workers throughout the country. Observations have also been made in important representative strawberry-growing regions and on breeding grounds and test plots at the time the berries were ripening,

[1] For further information as to varieties of strawberries and their cultivation the reader is referred to the following Farmers' Bulletins, which will be sent free on application to the Secretary of Agriculture. No. 901, Everbearing Strawberries. No. 1026, Strawberry Culture: South Atlantic and Gulf Coast Regions. No. 1027, Strawberry Culture: Western United States. No. 1028, Strawberry Culture: Eastern United States.

[2] The original edition of this bulletin was written by George M. Darrow.

and the condition of the fruit on arrival in the larger markets has been studied.

ORIGIN OF CULTIVATED STRAWBERRIES

Modern strawberry varieties have been derived chiefly from two American species—the wild meadow strawberry of eastern North America (*Fragaria virginiana*) and the beach strawberry found along the beaches of the Pacific coast from Alaska to California and along the coast of Chile (*Fragaria chiloensis*). The beach strawberry is also found on the mountains of the Hawaiian Islands. These two species were taken to Europe and hybridized there to produce the forerunners of the modern strawberry varieties.

Both wild species show many variations, and cultivated sorts show even more. Varieties are known that produce no runners; others have five leaflets to each leaf; and still others have fruit of various shapes, sizes, colors, and flavors. There are, however, no pure white cultivated varieties, though some are white with a slight pink color on one side. Neither is there a bush strawberry, though the old crowns of most varieties may become woody.

No fertile hybrids of the strawberry with other fruits have been produced. The so-called strawberry-raspberry is a raspberry species from Asia, and the strawberry bushes or trees are various plants that are not strawberries at all.

RELATION OF VARIETIES TO DEVELOPMENT OF THE INDUSTRY

Commercial strawberry growing began in the United States about 1800, the principal interest being in the vicinity of the four largest cities, Boston, New York, Philadelphia, and Baltimore. The industry remained largely in the vicinity of these cities until about 1860, when the growing of the Wilson variety, which originated in 1851, became general. During this period several varieties at one time or another were popular, the Large Early Scarlet being the principal one. Others, such as Early Hudson, Hudson's Bay, Crimson Cone, Red Wood, and Hovey, were also grown to some extent.

From 1860 to about 1885 the Wilson was the principal variety grown. With the introduction of this, a much better shipping variety than any previously known, commercial strawberry growing developed rapidly. As early as 1835 strawberry growing had reached commercial importance in the vicinity of Rochester, N. Y. In this region the Wilson first became generally grown, and until recent years it was grown there rather extensively for canning. With the introduction of the Wilson, strawberry growing in New Jersey first began to shift from the vicinity of New York to southern New Jersey. Following the Civil War, boat shipments of strawberries from the vicinity of Norfolk, Va., were sent to the New York market. At this time strawberry growing also began to develop rapidly in the Delaware and Maryland peninsula, and southwestern Michigan and southern Illinois began supplying the Chicago market with strawberries.

The rapid extension of railroads and the introduction of refrigeration in transit led to the further extension of strawberry growing into Tennessee, central Arkansas, Louisiana, and northern Florida between 1870 and 1890. Since 1890 North Carolina, central Florida,

Alabama, the Ozark region of Arkansas and Missouri, the Santa Clara Valley of California, and the Pacific Northwest have become important strawberry-growing regions.

The extent of the strawberry industry in the United States is shown in Figures 1 and 2. Figure 1 is based on the census statistics

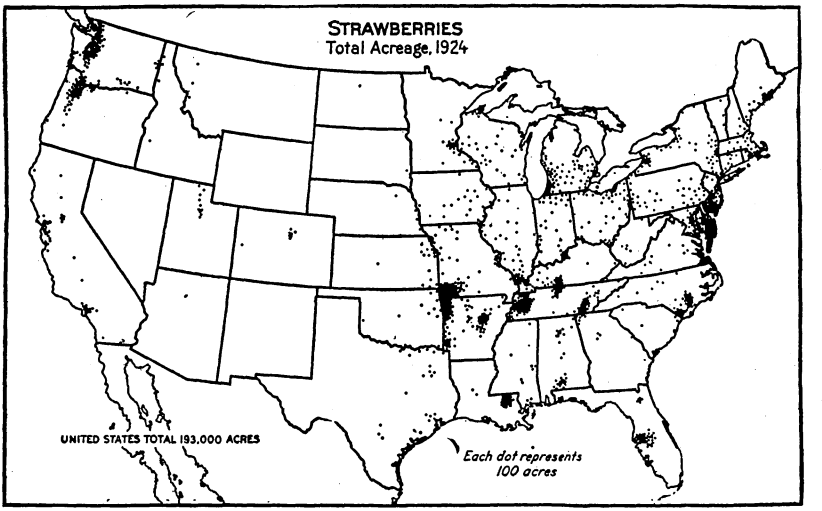

FIGURE 1.—Outline map of the United States showing the strawberry acreage in 1924

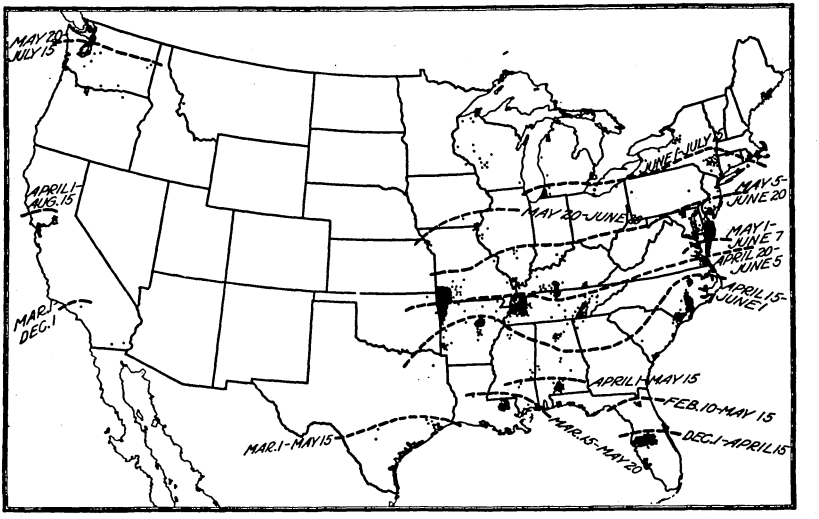

FIGURE 2.—Outline map of the United States showing the average number of carload shipments of strawberries for 1923, 1924, and 1925, together with the approximate shipping seasons. The dots represent 10 carloads each, except where they occur singly, when they may represent any number of carloads up to 10. (Data furnished by the Bureau of Agricultural Economics)

of 1924 and includes the total acreage for home and local markets as well as for shipment to general markets. Figure 2 is based on commercial shipments for the years 1923, 1924, and 1925 and shows the average number of carloads shipped in those three seasons, also the large centers of commercial production.

EXTENSION OF RIPENING SEASON

Wild strawberries do not often supply ripe berries for more than three weeks, and until the Wilson berry was introduced this was the usual length of time that fruit could be obtained in any one market. This variety made it possible to ship berries from southern regions to the northern markets, and with the introduction of still firmer sorts it became possible to obtain strawberries in the larger markets from early in the winter, when berries are shipped from Florida, until July, when berries ripen in the extreme North.

Since the introduction of the Progressive in 1912 it has been possible to obtain locally grown berries in most northern markets continuously from June to October. This variety continues to blossom and produce fruit under favorable conditions throughout the growing season and is exceptionally hardy and resistant to disease.

VARIETIES IN DIFFERENT REGIONS

Since 1900 many varieties especially adapted to conditions in various parts of the country have been introduced. Thus, the Missionary has become the leading sort in Florida and northward along the Atlantic coast to the Eastern Shore region of Maryland, and the Klondike in most other parts of the South; the Aroma in most of the milder regions of the Central States from southern Indiana, Illinois, and Missouri, south to Tennessee and northern Arkansas; the Dunlap in all of the Middle West north of the Aroma section; the Marshall, Oregon, Ettersburg 121, Clark, and Klondike in most parts of the Pacific Coast States; and the Howard 17 in the States north of the Ohio and Potomac Rivers and east of the Mississippi.

Aside from the nine varieties named above, few are grown extensively except in the Northeastern States. In that section, however, other sorts are widely grown, including the Chesapeake, Joe, Sample, Parsons, Belt (*William Belt*), Glen Mary, Williams, Heflin, and Pocomoke. Some of these varieties, however, are being replaced rapidly by Howard 17. Where irrigation is used in the Northeastern States the Chesapeake is the principal variety planted.

Until the Dunlap, which was originated at Urbana, Ill., was introduced in 1900, the growing of strawberries in much of the northern Mississippi Valley was difficult and too uncertain to be profitable. Now, however, strawberries are grown in home gardens in nearly all this region and for market throughout a large part of it. The Dunlap, which is the leading variety grown in the North Central States, is very hardy and productive and in all Northern States very resistant to disease. In recent years Howard 17 has been grown extensively as far north as Minnesota. Progressive, an everbearing sort, has been grown to some extent, but is rapidly being replaced by Mastodon.

Although strawberries were introduced early and grown commercially in Florida, Louisiana, and Texas, south of the regions where the wild strawberry is found, the industry in the Southern States has developed most rapidly since the introduction of varieties that have originated in that section. The Neunan, originating at Charleston, S. C., and introduced about 1868, began to replace Cres-

cent and Wilson about 1870, though the latter were important commercial varieties up to 1890. The Cloud, originating near Independence, La., was much grown with Neunan as a pollinizer. The Hoffman, originating near Charleston, S. C., from seed of the Neunan, became the most important variety in many of the South Atlantic and Gulf States from 1890 to 1905. The Thompson (*Lady Thompson*), which originated at Mount Olive, N. C., prior to 1891 and came into prominence about 1898, and Michel (early), which originated in Arkansas in 1886 and came into prominence in 1897, were the leading commercial sorts in the South from that time until the Klondike and Missionary became well known. These two varieties for several years past have been planted in the South for shipment almost to the exclusion of all others. The Klondike originated near Hammond, La., and was introduced in 1901. The Missionary was introduced in 1906, some sixe years subsequent to its origin in Norfolk County, Va. The Blakemore, introduced in 1929 by the United States Department of Agriculture, is suggested for trial in the Southern States and especially in the Atlantic coast region.

ADAPTATION OF VARIETIES

In the United States about 40 varieties of strawberries are grown rather extensively. Many of these will doubtless be discarded upon further trial or when others of better quality and better adapted to particular conditions or uses have been introduced. Many of them are suitable for very restricted sections of the country and for particular conditions and uses in those sections. Others are more widely adapted and may be used for many purposes.

In addition to these 40 sorts, several hundred others are raised to a slight extent, but most of them are inferior in productiveness, firmness, or some other characteristic of commercial importance.

ADAPTATION TO CLIMATE

The Missionary and the Klondike are adapted to the Southern States because they do not require a rest period during the winter but grow vigorously and form fruit buds during the short days of late fall, winter, and early spring. They also can endure the hot southern summers. Most northern varieties, however, seem to need a rest period during the winter and grow but little during the short winter days. They are adapted to a northern climate where they remain dormant during the winter and flower and fruit during the long days of early summer. It is chiefly these two reasons—the need or lack of a dormant period and the response to long or short days—that determine the regional adaptation of varieties.

The long dry summers of the Pacific coast hinder the development of leaf-spot diseases and make it possible to grow varieties like the Marshall and the Oregon, which are susceptible to these diseases. There are other climatic conditions not fully understood that limit the growing of the western varieties in the East and eastern varieties in most of the West. As stated elsewhere (p. 18), the Dunlap, Progressive, and a few other sorts are hardy in the upper Mississippi Valley regions. Most varieties can not withstand the cold drying winters of that part of the country.

ADAPTATION TO SOIL

The soil requirements of the different varieties are important, though to a less degree than the climatic requirements. Certain varieties, like the Klondike, Howard 17, and Dunlap, are adapted to a very wide range of soils, while others, such as the Aroma, Gandy, and Ettersburg 121, are much more exacting. The Aroma seems best adapted to a fairly heavy soil, such as a heavy silt loam, but the Gandy and the Ettersburg 121 do best on a clay loam. The reason for these differences in soil adaptation seems to lie, in part at least, in the amount of moisture that the different sorts can get from the

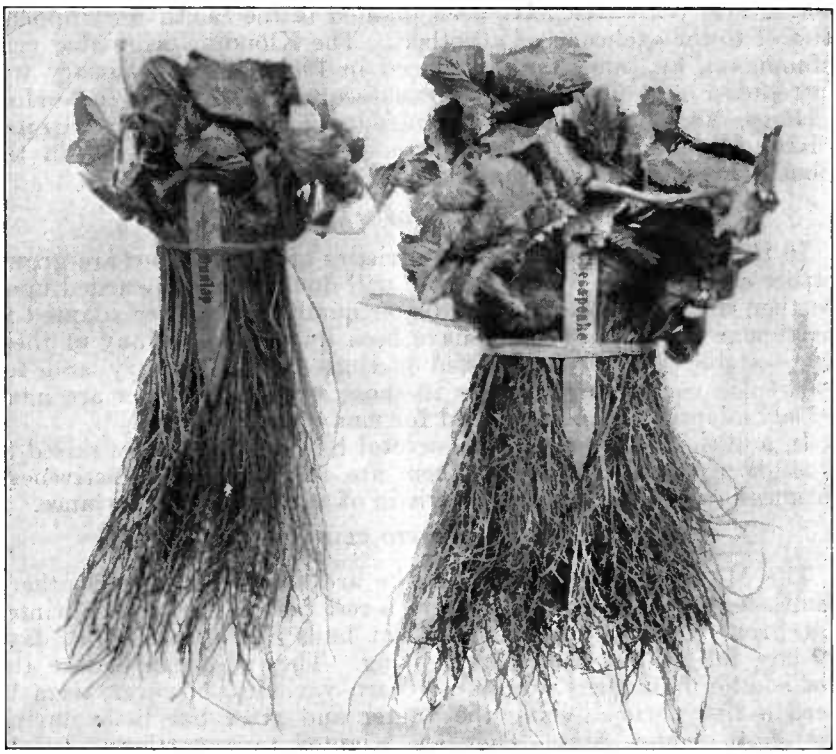

FIGURE 3.—Bundles of strawberry plants of the Dunlap and Chesapeake varieties, showing the differences in the root systems of these varieties. Each bundle contains 27 plants of average size for the variety

different soils through their roots. The root systems of different varieties, as shown in Figure 3, differ greatly. By a careful study of soil types and the behavior of different varieties when grown in them, it is possible to select sorts adapted to most farm lands. Wherever the soil adaptations of the varieties are known they are included in the characterizations given on pages 24 to 28.

ADAPTATION TO SPECIAL CONDITIONS

Besides the varieties adapted to certain climatic and soil conditions there are others which are suited to certain special conditions, such as irrigation and intensive garden culture. Thus, the Chesapeake is the variety best liked by those growing strawberries under

irrigation in the Northeast. This variety, which often fails to make a sufficient number of plants to produce profitable crops under non-irrigated conditions, makes an excellent stand and gives very large yields when irrigated. Likewise, the Marshall, Glen Mary, and some others, which do not yield satisfactorily under ordinary field treatment, produce very large crops when grown under intensive garden culture and when stable manure is applied.

Varieties that fruit well in certain localities may, nevertheless, be undesirable in those same locations. Thus, Howard 17 and many other sorts will produce good crops in parts of the South, but because they ripen after the fruit grown farther north is supplying the markets they are unprofitable from the standpoint of the commercial grower. The more southern growers can not compete with those located much nearer the northern markets, to which the fruit is largely shipped. The sequence of the shipping period in the different districts is shown in Figure 2. Berries in Florida ripen during the winter, while farther north the ripening follows in succession. Each grower, therefore, must select varieties that ripen in

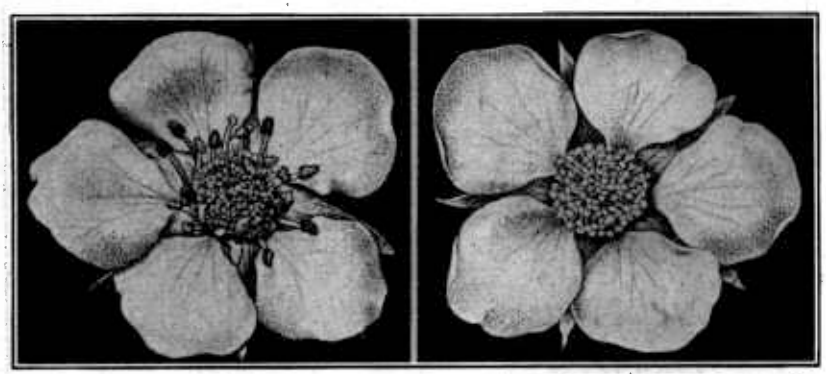

FIGURE 4.—Staminate and pistillate flowers of the strawberry. At the left is a perfect or staminate flower, having both stamens and pistils. At the right is an imperfect flower, having pistils but no stamens. Plants of varieties having imperfect flowers must have plants of perfect-flowered sorts growing near by in order to produce fruit, while the plants of a variety having perfect flowers will produce fruit even though no other sort is near

his locality at a time when the markets to which he ships are not fully supplied from other districts more favorably situated than his for supplying the demand.

Persons growing berries for the home table and the local market should plant a variety of high quality which ripens through a long season, or several sorts ripening in succession. In the vicinity of Washington, D. C., for instance, two varieties have been commonly grown to supply the local market. The Tennessee was the leading early sort in that locality, and it was followed by the Gandy as the leading late-ripening sort. Recently, however, the Howard 17 has replaced both to a large extent, as it ripens early and has a long season.

Varieties especially adapted to canning and preserving are grown in many localities. Persons growing berries for such a trade should plant sorts that are very productive, hull easily, and retain their form, color, and flavor when canned. The Ettersburg 121, Wilson,

Clark, Parsons, and others are used for such purposes in the regions where they are grown.

PERFECT AND IMPERFECT FLOWERS

Strawberries produce two general types of flowers—imperfect or pistillate and perfect or staminate. Imperfect or pistillate flowers contain pistils but not stamens, while perfect or staminate flowers contain both pistils and stamens. Pollen, which is produced in the stamens, is essential to the setting of fruit. A variety with perfect flowers, therefore, can produce fruit when planted by itself, but one with imperfect flowers can not set fruit unless perfect-flowering plants are near by to furnish pollen through the agency of bees or

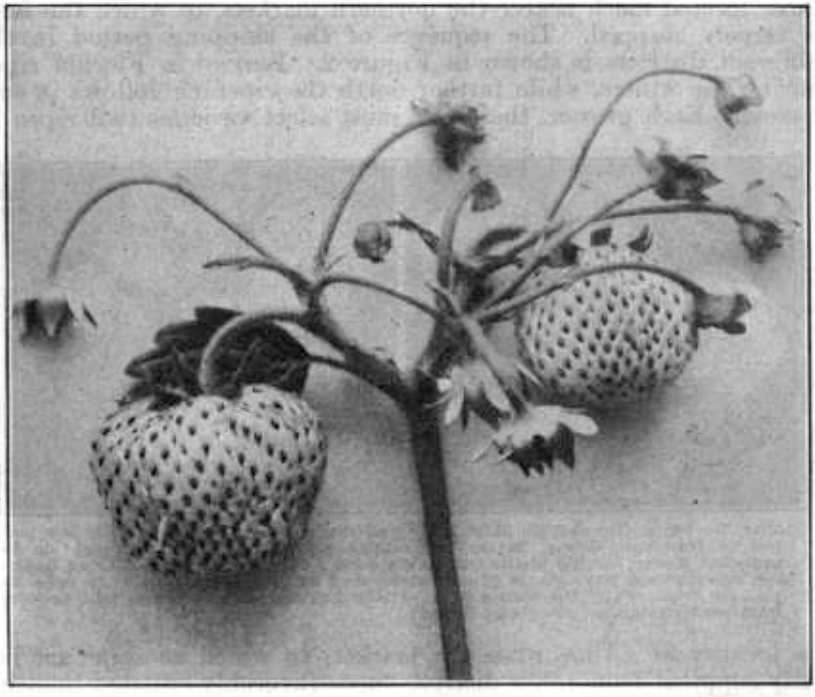

FIGURE 5.—A fruit cluster of the White Sugar variety in which only two of the flowers set fruit, the other flowers being sterile. In regions where as many of the blossoms are sterile as are shown here such a variety will hardly be profitable. All or nearly all perfect-flowered varieties show more or less sterility

other insects. Because of this, varieties having imperfect flowers are not so desirable as those having perfect flowers, and fewer of them are grown. However, some of the sorts having imperfect flowers, or "imperfect varieties" as they are commonly called, are very productive and are liked in certain sections. Imperfect varieties also are injured less by the strawberry weevil than perfect sorts, since this insect feeds on pollen; and, in regions where it is serious, imperfect sorts are often grown in relatively large proportions. However, they form less than 5 per cent of the total acreage devoted to

strawberries in the United States, and their planting appears to be decreasing.

Where imperfect varieties are used the usual practice in planting is to set one row of a perfect variety for every two or three rows of an imperfect one. Figure 4 shows both types of flowers.

Certain sorts, the Glen Mary and the Progressive of the ones most commonly grown, under ordinary conditions produce flowers having both stamens and pistils, but frequently, under peculiar weather con-

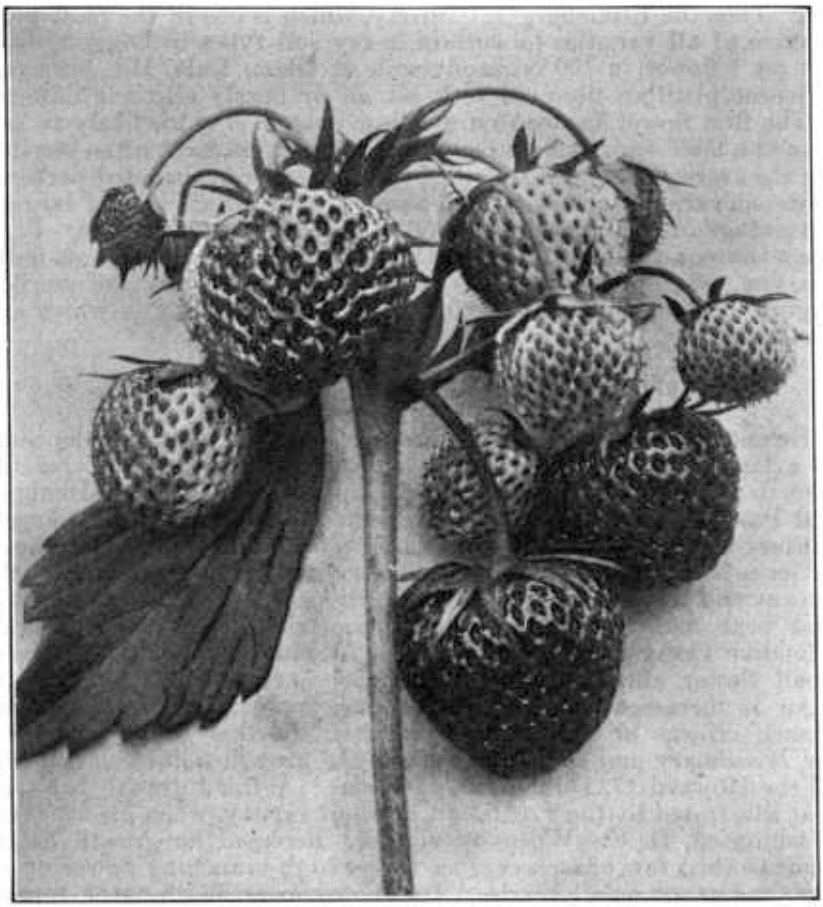

FIGURE 6.—A fruit cluster of the Klondike, a perfect-flowered variety, in which all the flowers set. Often, however, the Klondike does not set all its flowers

ditions, they produce so few good stamens that they do not have sufficient pollen to insure the setting of fruit. When these varieties do not set well, a variety producing an abundance of pollen should be planted with such sorts in the proportion that perfect varieties are usually planted with imperfect ones. Apparently, less pollination trouble is experienced with these sorts if they are grown on very fertile soil.

PARTIAL STERILITY OF PERFECT-FLOWERED VARIETIES

The flowers of pistillate-flowered varieties nearly always all set fruit when pollinated. The blossoms of perfect-flowered varieties, however, rarely all set fruit. Though rain, frost, disease, and insect injury may prevent the setting of some flowers, the most common and most important cause is the sterility of the pistils. These flowers with sterile pistils appear normal but set no fruit or only "nubbins." Under some conditions not 1 in 50 of the flowers of some varieties set. Thus the Ettersburg 121 variety, which is one of the most productive of all varieties on certain heavy soil types in Oregon, does not set 1 flower in 100 on sandy soils at Glenn Dale, Md., whereas adjacent pistillate-flowered sorts set all or nearly all their flowers.

The first flower to open on a flower cluster is more likely to set than the later ones, and the last ones to open are most often sterile. On the average about one-third of the blossoms of cultivated perfect-flowered varieties are sterile. Those varieties which set the largest percentage of their flowers in any locality should be selected. Figure 5 shows a fruit cluster of the White Sugar variety in which only the first two flowers to open have set; all the others are sterile. Figure 6 shows a fruit cluster of the Klondike variety in which all the flowers set.

FRUIT PRODUCTION AND GROWTH HABIT

Recent studies have shown that the value of varieties depends in a large part on their growth habit. One of the best types of growth for Eastern States is that shown by the Howard 17, Dunlap, and Parsons, which tend to produce irregular low-branching flower clusters with relatively large berries. When the soil on which these varieties are grown is quite fertile their vigor is expressed in branch crowns and increased size of low-branching irregular flower clusters that bear many large berries. In contrast, the Missionary and Klondike varieties on sandy soil near Washington tend to produce small flower clusters which are high-branching and when their vigor is increased they tend to produce more runner plants than branch crowns or large flower clusters. Farther south, however, the Missionary and Klondike tend to the growth habit represented by the Howard 17, Dunlap, and Parsons. A third growth habit is that illustrated by the Portia, a Canadian variety, when grown near Washington, D. C. When its vigor is increased its growth habit tends toward few branch crowns, larger high-branching flower clusters, and many small berries. Its growth near Washington represents a habit much less desirable than that of Howard 17.

VARIETIES FOR DIFFERENT STATES

For the purpose of obtaining information on the varieties best adapted to different regions, a large number of commercial growers in the important producing districts in all parts of the United States were requested to give the names of the leading sorts in their localities, together with information concerning the acreage, relative importance, and merits of each variety as grown under their conditions. In addition, personal visits were made to nearly all important com-

mercial regions, and most of the State agricultural experiment stations assisted in furnishing information on strawberry varieties. The lists given in Table 1 have been compiled from information thus obtained.

HOW TO USE THE LIST OF VARIETIES

The lists in Table 1 are arranged alphabetically by States and, under the States, by the districts in which strawberries are grown commercially. The varieties are placed approximately in the order of their commercial importance in the different districts, and in the column headed " Season and use " the purpose for which each variety is especially adapted is given where particular merit is known to exist. In using the lists the following points should be kept in mind:

(1) The variety lists are suggestive only. Under certain local conditions other sorts may be fully as desirable as those named.

(2) In the Northeastern States many strawberry varieties seem exacting in their climatic and soil requirements. Therefore, in many instances, several varieties having the same season of ripening are named. One's choice of varieties under these conditions should be guided by the experience of neighbors, so far as it can be used.

(3) The listing of varieties for certain districts and for certain States should not be construed as evidence that conditions therein are necessarily favorable to the development of a commercial strawberry industry. On the other hand, many sections not named in the lists are well adapted to strawberry growing, those mentioned being simply those in which the principal development has taken place.

(4) The fact that a variety is adapted to a certain purpose in one region is not necessarily evidence that it will be adapted to a similar purpose in another region.

(5) In some localities the sequence of ripening is of great importance. The relative time of ripening given in this list, however, is only approximate. Conditions within a given region vary widely, and the time of ripening will be largely dependent upon local conditions. Varieties for a particular district should be selected so that they will ripen at a time when the markets in which they are to be sold are not fully supplied from other districts more favorably located; otherwise, an unequal competition is inevitable at times.

(6) With the increase of interest in strawberry breeding and increased knowledge of the work, better sorts are continually being originated. New varieties worthy to replace some of the standard sorts of the present time have already been produced and may be expected to come into prominence gradually. It is probable that still better varieties will be developed in the future.

(7) In selecting varieties for a place not specified in the lists, one should choose sorts grown where the conditions are as nearly as possible like those of the place in question.

(8) The lists should be used in connection with the characterizations of varieties given on pages 24 to 28.

LIST OF VARIETIES BY STATES

TABLE 1.—*Lists of strawberry varieties arranged by States and sections*

[Names of imperfect varieties are followed by the abbreviation "imp." The lists show the varieties most commonly grown in the various regions. Those recommended for commercial planting are marked with an asterisk (*). Under "Season and use" the terms early, everbearer, medium late, midseason, late, short, throughout summer, etc., relate to the season of fruitage; the terms canning, dessert, general use, home use, main crop, market, shipping, etc., show the purpose for which the variety is grown]

State, district, locality, and variety	Season and use
ALABAMA	
South of Cullman:	
*Klondike	
*Missionary	
North of Cullman:	
*Aroma	Late.
Klondike	Early.
ARKANSAS	
Horatio:	
*Klondike	
Judsonia:	
*Klondike	Early.
*Aroma	Late.
Ozark region:	
*Klondike	Early.
*Aroma	Late.
Throughout the State:	
North of Judsonia—	
*Klondike	Early.
*Aroma	Late.
South of Judsonia—	
*Klondike	Early.
*Aroma	Late.
ARIZONA	
Throughout the State:	
Arizona	
*Klondike	
St. Louis	
CALIFORNIA	
Fresno:	
*Marshall	Throughout summer.
*Oregon	Do.
Brandywine	Do.
Los Angeles:	
Brandywine	Do.
*Klondike	Spring crop only.
Excelsior	
Nich Ohmer	
Sacramento:	
*Marshall	
*Oregon	
San Francisco:	
*Marshall (*Banner*)	
*Oregon	
*Nich Ohmer	
Throughout the State:	
North of Fresno—	
*Marshall	
*Oregon	
*Dollar	
*Nich Ohmer	
South of Fresno—	
*Brandywine	Dessert.
*Klondike	Shipping.
COLORADO	
Throughout the State:	
*Dunlap	Early.
*Jucunda	Late.
*Howard 17 (*Premier*)	
CONNECTICUT	
New Haven:	
*Howard 17	Early, long season.
Glen Mary	Midseason.
Late Stevens	Late.
*Chesapeake	Do.
Gandy	Do.
Throughout the State:	
*Howard 17	Very early.
*Sample	Do.
Dunlap	Midseason.
Glen Mary	Do.
Chesapeake	Do.
Gandy	Do.
Progressive	Everbearer.
Mastodon	Do.
DELAWARE	
Sussex County:	
*Missionary	Early, preserving.
*Howard 17 (*Premier*)	Early.
*Chesapeake	Late.
*Gandy	Do.
*Lupton	Do.
*Joe	Do.
Throughout the State:	
*Howard 17	Early.
*Joe	Late.
*Lupton	Do.
*Gandy	Do.
*Missionary	Early.
*Chesapeake	Late.
DISTRICT OF COLUMBIA	
Washington:	
*Howard 17	Very early.
*Gandy	Late.
*Chesapeake	Do.
FLORIDA	
Plant City-Lakeland:	
*Missionary	Practically no other planted.
Starke-Lawtey:	
*Missionary	Chief variety.
Klondike	Few grown.
GEORGIA	
North of Atlanta:	
*Aroma	Late.
*Klondike	Early.
South of Atlanta:	
*Klondike	
*Missionary	
IDAHO	
Throughout the State:	
*Superb	Everbearer.
Progressive	Do.
Mastodon	Do.
*Glen Mary	Local market.
Brandywine	Do.
Belt (*William Belt*)	Do.
Marshall	Do.
Dunlap	

TABLE 1.—*Lists of strawberry varieties arranged by States, etc.*—Con.

State, district, locality, and variety	Season and use
ILLINOIS	
Anna:	
Gandy	Late.
Klondike	Early.
*Aroma	Medium late.
Throughout the State:	
Northern district—	
*Dunlap	Best variety.
*Howard 17 (*Premier*)	Very early.
*Burrill	
Parsons (*Gibson*)	
Mastodon	Everbearer.
Southern district—	
Dunlap	
Gandy	Late.
*Aroma	Medium late.
Klondike	
INDIANA	
New Albany:	
*Aroma	Shipping.
Gandy	
Dollar Mark	
Throughout the State:	
*Howard 17 (*Premier*)	Very early.
*Dunlap	Local market.
*Aroma	Shipping.
*Gandy	Late.
Mastodon	Everbearer.
IOWA	
Keokuk:	
*Dunlap	
Warfield (imp.)	
Throughout the State:	
*Dunlap	Leading sort.
Warfield (imp.)	
*Progressive	Everbearer.
KANSAS	
Doniphan County:	
*Aroma	Best shipping.
Dunlap	
*Howard 17	Early.
Mastodon	Everbearer.
Throughout the State:	
*Dunlap	Hardy.
*Aroma	Shipping.
*Howard 17	Early.
KENTUCKY	
Bowling Green, Paducah, and Franklin:	
*Aroma	
Throughout the State:	
*Aroma	
*Howard 17 (*Premier*)	Early.
LOUISIANA	
Throughout the State:	
*Klondike	
MAINE	
Throughout the State:	
*Dunlap	Midseason.
*Howard 17	Very early.
*Sample (imp.)	Late.
Marshall	Special markets.
*Glen Mary	Midseason.
*Progressive	Everbearer.
Belt (*William Belt*)	
MARYLAND	
Eastern Shore:	
*Missionary	Barreling, early.
*Howard 17 (*Premier*)	Early.
*Chesapeake	Late.
*Joe	Do.
*Lupton	Do.
*Gandy	Do.
Western section:	
*Howard 17	Very early.
*Gandy	Late.
MASSACHUSETTS	
Concord:	
*Howard 17	Early.
*Glen Mary	Midseason.
Falmouth:	
*Howard 17	Early.
Echo	
Marshfield Hills:	
*Marshall	
*Howard 17	
Dighton:	
*Howard 17	
*Abington	
Fitchburg:	
*Howard 17	
Glen Mary	
Throughout the State:	
*Howard 17	Very early.
*Dunlap	Midseason.
*Sample (imp.)	Late.
Abington	
First Quality	
Mastodon	Everbearer.
MICHIGAN	
Southwestern Michigan:	
*Dunlap	Midseason.
*Parsons (*Gibson*)	
*Howard 17 (*Premier*)	
Mastodon	
Aroma	
Throughout the State:	
*Dunlap	Do.
*Howard 17 (*Premier*)	Very early.
*Parsons (*Gibson*)	Midseason.
*Progressive (*Champion*)	Everbearer.
Mastodon	Do.
MINNESOTA	
Throughout the State:	
*Dunlap	
*Progressive	
*Howard 17 (*Premier*)	
Minnehaha	Late.
Duluth	Everbearer.
Chaska	
Easypicker	
MISSISSIPPI	
Throughout the State:	
Klondike	
MISSOURI	
Ozark section:	
*Aroma	Late.
Klondike	Early.
Gandy	Late.
North of Missouri River:	
*Dunlap	
*Progressive	Everbearer.
*Howard 17 (*Premier*)	Early.

TABLE 1.—*Lists of strawberry varieties arranged by States, etc.*—Con.

State, district, locality, and variety	Season and use
MISSOURI—continued	
South of Missouri River:	
Dunlap	Home use.
*Aroma	Shipping.
St. Louis County:	
*Howard 17	Early.
*Gandy	Late.
*Aroma	
*Dunlap	
MONTANA	
Throughout the State:	
*Dunlap	
*Progressive	Everbearer.
NEBRASKA	
Throughout the State:	
*Dunlap	
Warfield (imp.)	
Bederwood	
Progressive	Everbearer.
Mastodon	Do.
NEVADA	
[Varieties grown in Utah and California should be tried]	
NEW HAMPSHIRE	
Throughout the State:	
Dunlap	Midseason.
*Howard 17	Very early.
Sample (imp.)	Late.
Marshall	Special market.
Progressive	Everbearer.
Heritage	
Stevens	Late.
NEW JERSEY	
Southern district:	
*Lupton	Late.
*Howard 17	Early.
*Chesapeake	Irrigated fields.
*Aberdeen	
Joe	
Belt	
Northern district:	
*Howard 17	Early.
*Chesapeake	Late, irrigated fields.
*Joe	Late.
*Aberdeen	
NEW MEXICO	
Throughout the State:	
Dunlap	
Arizona	
*Klondike	
NEW YORK	
Oswego:	
*Late Stevens	
Dunlap	
Glen Mary	
Belt	
Marshall	
Rochester:	
*Howard 17	Early
*Glen Mary	Midseason.
*Sample (imp.)	Late.
Erie and Chautauqua Counties:	
*Parsons	Canning.

State, district, locality, and variety	Season and use
NEW YORK—continued	
Highland and Milton:	
Belt (*William Belt*)	
Gandy	
Chesapeake	
Joe	
Glen Mary	
Throughout the State:	
*Howard 17	Very early.
*Glen Mary	
*Joe	
*Parsons	
Sample (imp.)	Late.
*Belt (*William Belt*)	
*Marshall	Special market.
New York	
Gandy	Late.
Brandywine	
Progressive	Everbearer.
Mastodon	Do.
NORTH CAROLINA	
Chadbourn:	
*Klondike	
Missionary	
Wallace district:	
*Missionary	
Klondike	
Blakemore	
Throughout the State:	
*Missionary	
*Klondike	
Blakemore	
NORTH DAKOTA	
Throughout the State:	
*Dunlap	
*Progressive	Everbearer.
Dakota	Very hardy.
OHIO	
Southern district:	
*Aroma	Medium late.
*Gandy	Late.
Northern district:	
*Howard 17	Very early.
*Dunlap	Midseason.
Gandy	Late.
Sample (imp.)	Do.
Parsons	
Chesapeake	
Progressive	Everbearer.
Mastodon	Do.
OKLAHOMA	
Throughout the State:	
*Klondike	
Aroma	
Howard 17	
OREGON	
Hood River:	
*Clark	
Willamette Valley:	
Gold Dollar	Early local market.
Magoon	Midseason local market.
*Marshall	Midseason local market and barreling.
Oregon	Do.
*Ettersburg 121	On heavy soils; canning.
*Wilson	On rich soils; canning.
Progressive	Everbearer.

TABLE 1.—*Lists of strawberry varieties arranged by States, etc.*—Con.

State, district, locality, and variety	Season and use
PENNSYLVANIA	
Stoneboro:	
*Sample	
Belt	
Parsons (*Gibson*)	
Warfield	
*Howard 17	
Luthersburg:	
*Sample	
Dunlap	
Cooper	
Corsican	
*Howard 17	
Throughout the State:	
*Howard 17	Very early.
*Joe	
Gandy	Late.
Dunlap	Midseason.
Belt (*William Belt*)	
*Sample (imp.)	Late.
Chesapeake	
Cooper	
Mastodon	
RHODE ISLAND	
Throughout the State:	
*Howard 17	Very early.
*Marshall	Special market.
*Dunlap	Midseason.
*Sample (imp.)	Late.
Progressive	Everbearer.
SOUTH CAROLINA	
Throughout the State:	
*Missionary	
*Klondike	
Thompson	
SOUTH DAKOTA	
Throughout the State:	
*Dunlap	
*Warfield (imp.)	
*Progressive	Everbearer.
Sample (imp.)	
TENNESSEE	
East Tennessee:	
*Aroma	Late.
*Klondike	Early.
Central Tennessee:	
Klondike	Early.
*Aroma	Late.
West Tennessee:	
*Klondike	Early.
Gandy	Late.
Aroma	Do.
TEXAS	
San Antonio section:	
*Klondike	
*Missionary	
Houston:	
*Missionary	Main crop.
*Klondike	Do.
Excelsior	Very early.
Tyler:	
*Klondike	

State, district, locality, and variety	Season and use
UTAH	
Throughout the State:	
Aroma	
Chesapeake	
Marshall	
Glen Mary	
Parsons (*Gibson*)	
Howard 17	
VERMONT	
Throughout the State:	
*Dunlap	Midseason.
*Howard 17	Very early.
*Sample (imp.)	Late.
Glen Mary	Midseason.
*Belt (*William Belt*)	
Marshall	
*Progressive	Everbearer.
Superb	
VIRGINIA	
Western Virginia:	
Howard 17	Early.
Joe	Late.
Klondike	Early.
Norfolk:	
*Missionary	
Klondike	
Eastern Shore counties:	
*Howard 17	Early.
*Missionary	
*Heflin	Early.
Gandy	Very late.
WASHINGTON	
White Salmon:	
*Clark	
Puget Sound region:	
*Marshall	General use and barreling.
*Oregon	Do.
*Gold Dollar	Early local market.
Ettersburg 121	On heavy soils: canning.
Clark	Shipping and canning.
Magoon	
Spokane:	
Glen Mary	Market and barreling.
Oregon	
WEST VIRGINIA	
Throughout the State:	
*Aroma	
*Gandy	
*Howard 17	Early.
Dunlap	
WISCONSIN	
Throughout the State:	
*Dunlap	
*Warfield (imp.)	
Howard 17 (*Premier*)	
Bederwood	
*Progressive	Everbearer.
WYOMING	
Throughout the State:	
*Dunlap	
Bederwood	

It will be noted from Table 1 that only a comparatively small number of varieties are grown extensively in this country, while in some States only one sort is grown to any considerable extent. Many varieties listed, although important in some locality, are comparatively unimportant when the industry as a whole is considered. Such varieties do not usually remain in cultivation long, for nurserymen do not find them as profitable to propagate as the widely grown sorts. Furthermore, local varieties are not known by the trade so well as the standard sorts, and the fruit is not wanted by buyers unless of exceptionally good quality and grade. Therefore, under ordinary conditions, growers shipping to the general markets should raise only well-known varieties.

IMPORTANCE OF THE VARIETIES

In Table 2 the varieties are listed in the order of their importance in the country on the basis of the acreage planted to each. The table gives the approximate percentage of the total acreage in the country devoted to each variety in 1929.

It should be noted that 19 sorts constituted about 96 per cent of the total commercial strawberry acreage in the United States in 1929.

The first three sorts—Klondike, Aroma, and Howard 17—constituted 63 per cent of the acreage. In 1919 the Howard 17 variety had been only recently introduced and was considered a promising new sort. Ten years later, it had become one of the three principal varieties in the country. It has largely replaced a number of minor varieties and apparently will replace others. This is a demonstration of the rapidity with which a variety of superior merit comes into popular favor. Eight of the varieties in Table 2 are known to have originated as the result of definite work for the production of better varieties. These constituted over 71 per cent of the total acreage in strawberries in the United States in 1929.

As indicated in the last item in Table 2, " other varieties " make up 4 per cent of the total acreage devoted to strawberries. This 4 per cent is composed principally of 20 varieties, as follows: Late Stevens, Clark, Wilson, Warfield, Jucunda, Nich Ohmer, Excelsior, Haverland, Campbell, Success, Echo, Williams, Abington, Magoon, Gold Dollar, New York, Big Late, Brandywine, Aberdeen, Progressive, and Burrill. There are many other varieties in the trade, but they are grown to such a limited extent as to be practically negligible as varieties from a commercial standpoint.

TABLE 2.—*The principal strawberry varieties in the United States in the order of their importance in 1929 on the basis of the estimated acreage of each*

Rank	Variety	Total acreage (per cent)	Rank	Variety	Total acreage (per cent)
1	Klondike	25.0	13	Belt	1.0
2	Aroma	22.0	14	Sample	1.0
3	Howard 17	16.0	15	Ettersburg 121	1.0
4 and 5	Marshall and Oregon	7.0	16	Glen Mary	1.0
6	Dunlap	6.0	17	Lupton	1.0
7	Missionary	6.0	18	Heflin	.5
8 and 9	Parsons and Pocomoke (*Gibson*).	3.0	19	Mastodon	.5
				Other varieties	4.0
10	Gandy	2.0			
11	Chesapeake	1.5		Total	100.0
12	Joe	1.5			

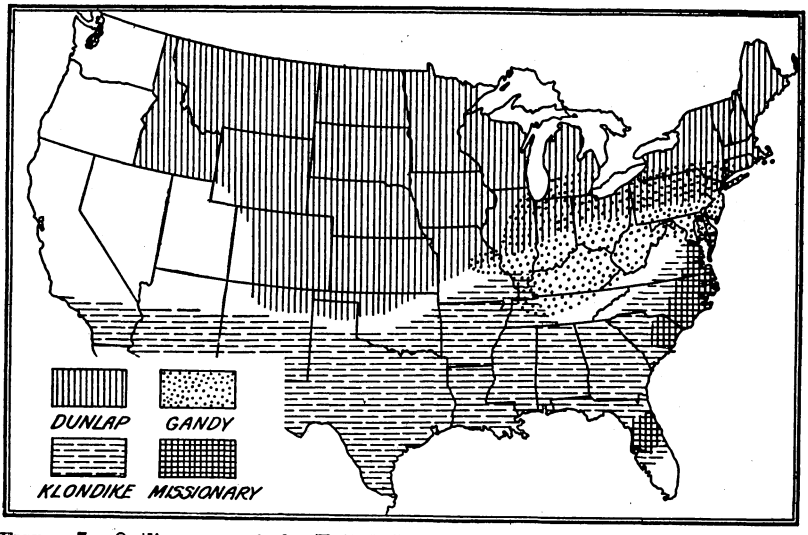

FIGURE 7.—Outline map of the United States, showing where the Dunlap, Gandy, Klondike, and Missionary varieties of strawberries are profitably grown. The Missionary variety is grown in some sections other than those shown, but is recommended only for the area indicated

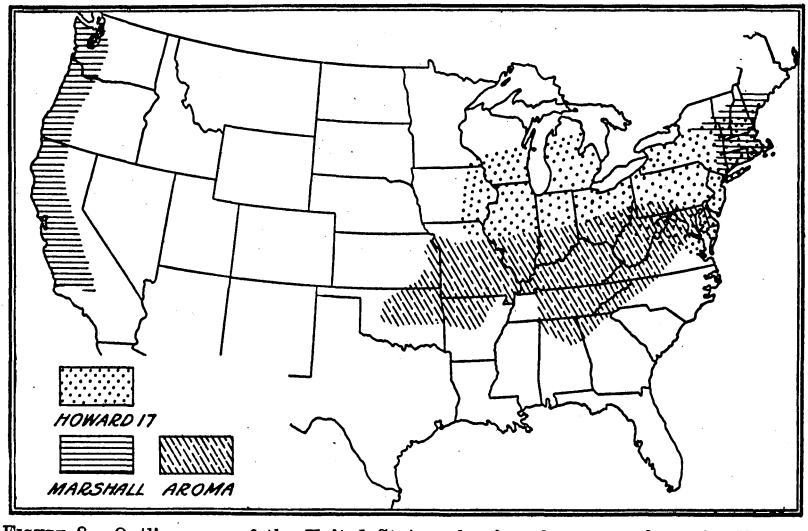

FIGURE 8.—Outline map of the United States, showing the areas where the Howard 17, Marshall, and Aroma varieties of strawberries are grown extensively

The maps shown as Figures 7 and 8 outline the regions where the Klondike, Aroma, Dunlap, Gandy, and certain other important varieties are principally grown. The regions thus outlined are approximate only, and probably exclude small areas where these varieties are raised. They show, however, the wide distribution of certain varieties, suggesting at the same time that many of them are adapted to wide variations in soil and climate.

VARIETIES FOR SPECIAL PURPOSES

Not all sorts are equally well suited to all purposes, and growers often use certain varieties for special markets. For home gardens, several sorts may be needed, ripening from early to late. In many localities where large quantities of berries are barreled or canned, varieties especially adapted to this purpose are needed.

VARIETIES FOR CANNING

Varieties for the canning trade should be productive and should bear medium-sized firm-fleshed berries, separating readily from the calyx (hull or cap), deep red to the center, and brisk subacid to acid in flavor. Berries having a color that does not fade readily when canned make the most attractive product and are the most desirable.

Most canned strawberries are packed in Oregon and Washington, where the Ettersburg 121 is extensively grown for this purpose. The Wilson is still used to some extent for canning in western Oregon and Washington. In fact, this variety is grown at present only because of its superior canning qualities. The Clark, grown in the Hood River Valley, is a most excellent canner. In some northern States the Parsons (*Gibson*) is preferred. In the Middle West the Warfield and the Dunlap are used for this purpose. A new variety, Portia, originating in Canada, is also considered very desirable for canning.

VARIETIES FOR PRESERVING AND ICE CREAM

Varieties for preserving should be easy to cap, medium sized, firm, with a high flavor and a light bright-red color that does not turn dark after preserving. For the ice-cream trade, varieties with a deep-red color and high flavor are desired. The best preserving sort is the Blakemore, a new variety known to be adapted to the region from New Jersey to Georgia. For the ice-cream trade the Marshall and the Klondike are liked, though other kinds are used. Because of the low cost of production and the steady supply, the larger part of the berries for preserving and the ice-cream trade are packed in Oregon and Washington and are of the Marshall and Oregon varieties.

VARIETIES FOR SHIPPING

The following varieties when grown in regions to which they are adapted are among the best for shipping to distant markets: Klondike, Aroma, Clark, Missionary, Gandy, Chesapeake, Joe, Campbell, Lupton, and Nich Ohmer. The Blakemore is a particularly good shipping sort. Although these sorts are firm in some sections, they may not be and often are not good shipping sorts in other sections. Therefore a grower who ships to distant markets should select varieties that have proved to be firm when grown in his locality and should not rely too much on the reported behavior of a variety in some section remote from his own.

VARIETIES FOR SEVERE WINTER CLIMATES

In the upper Mississippi Valley it is essential that very hardy sorts be selected. Lack of moisture, drying winds, and low temperatures in winter combine to make very trying conditions, and only a very few sorts succeed there. Of the commercial sorts the Pro-

gressive, an everbearer, is considered the hardiest, the Dunlap next, and the Warfield next. Howard 17 and Mastodon are also hardy in some parts of this region. Minnehaha, Chaska, Duluth, and Easypicker, new varieties developed in Minnesota, seem particularly adapted to this region. The Dakota, though not considered a commercial variety, can be grown in parts of North Dakota and South Dakota where even the Progressive is not hardy.

FROST RESISTANCE

Of the standard varieties the Howard 17 is much superior to other sorts in resistance to frost injury. Chesapeake and Parsons are reported as more resistant than some other sorts, and in Canada the Jucunda has been considered the most resistant to frost injury.

DISEASE RESISTANCE[3]

The most serious fungous diseases affecting strawberry plants are Botrytis or gray mold and the various leaf spots. The Botrytis attacks the stem, calyx, and fruit in various stages of development. In rainy seasons the loss caused by this fungus is often serious, and in sections where such seasons occur frequently during the fruiting period those varieties should be selected which appear from wide observation to be least susceptible. Varieties believed to be more or less resistant are the Sample, Chesapeake, and Aroma, but under conditions especially favorable for the development of the disease their resistance is sometimes less pronounced.

There is a wide range of variation in the resistance of varieties to leaf spots, which occur wherever strawberries are grown. In semiarid regions the leaf spots do little damage. They often cause serious injury in the North, but are especially destructive in the Southern States. Varieties such as Glen Mary and Marshall, which are susceptible to these diseases, are limited in their range to semiarid and northern regions. Some sorts, however, show marked resistance, among them the Chesapeake and Howard 17.

In some sections of the United States and in certain seasons considerable damage to the foliage of the Gandy and some other varieties is caused by mildew. It is of much less common occurrence, however, than either of the other diseases mentioned and is not of great importance, as a rule, on the more generally grown commercial sorts.

INSECT RESISTANCE

Less is known of the relative susceptibility of strawberry varieties to the various insect pests than of their susceptibility to diseases of the foliage and fruit. It is known, however, that the Chesapeake is more resistant than many sorts to attacks of the red spider and thrips. Varieties having imperfect flowers are known to be damaged very little by the weevil, while in certain sections those having perfect flowers are often severely injured. Therefore, wherever the weevil does serious damage, growers sometimes plant imperfect varieties, with the perfect varieties least susceptible to injury by the weevil for pollinators. Among the perfect sorts badly injured by the weevil are the Heflin, Klondike, and Missionary. The Howard

[3] For further information see Farmers' Bulletin 1458, Strawberry Diseases.

17, Chesapeake, Aroma, and Mascot have been the least attacked, while the Gandy seems to be less susceptible than many other sorts.

SIZE, FLAVOR, AND QUALITY OF FRUIT

Among the varieties having large, showy fruit are the Chesapeake, Portia, Joe, Lupton, Marshall, Oregon, Magoon, Howard 17, and Judith.

Many persons who can not eat certain varieties of strawberries because of their high acidity can eat the milder flavored sorts without harm. The New York is considered one of the best for such use, as it is very mild. Other mild-flavored sorts are the Marshall, Chesapeake, Belt, and Judith.

The quality of strawberry varieties is influenced to a large extent by climate and local weather conditions. Furthermore, varieties that appeal to certain individuals as of very high quality do not so appeal to others. Some like varieties with a very mild flavor, while others like those having a pronounced flavor and considerable acidity. Varieties vary greatly from season to season in the same section, and often have higher dessert quality toward the end of the season than at the beginning. Moreover, a variety may have good dessert quality in one locality, but this quality may be poor in a section having a different climate. Thus, the Nich Ohmer is almost insipid in Florida, but often has high quality in New Jersey and California.

The Marshall, Judith, and Oregon are among the varieties having the best dessert quality, and all are mild in flavor. Other varieties of high quality are the Belt, Chesapeake, Joe, Dunlap, New York, and Howard 17.

VARIETIES ADAPTED TO HILL CULTURE

Along the South Atlantic and Gulf coast, plants of the Klondike and Missionary are commonly set late in summer or in autumn and do not have an opportunity to make runners before fruiting the following season. They are therefore grown in accordance with the hill system. In other parts of the United States east of the Rocky Mountains these sorts are ordinarily grown under the matted-row system.

In the irrigated regions of the West nearly all varieties are grown, to some extent at least, under the hill system. Among these are the Clark, Marshall, Magoon, Superb, Dollar, Klondike, Oregon, Brandywine, Jucunda, and Ettersburg 121.

In humid regions some varieties are more productive under the matted row and others under the hill system of culture. Those grown in hills, however, are usually sorts that bear showy fruit of high quality or that make comparatively few runners. The most important of these sorts are the Chesapeake, Marshall, and Joe, and among the everbearers the Progressive and Mastodon.

EARLY, MIDSEASON, AND LATE VARIETIES

It is difficult to classify varieties according to their season of ripening, because this period is influenced by local weather conditions, by climate, exposure, soil, and the treatment given the plantation. Thus the Missionary, which is an early variety in Maryland, may begin to bear in Florida in December and continue until May

and June under favorable conditions. The Brandywine and Marshall mature their fruit in June in Massachusetts, but in California they may begin in April and fruit almost continuously until November. Weather conditions also affect the length of the ripening season, and a variety that ordinarily ripens its crop in a short period may, in cool weather, have a season extending over several weeks. Varieties are affected differently by cool weather; some that are early and ripen very rapidly in warm weather may be late and ripen very slowly when the weather is cool. Exposure, type of soil, and cultural conditions also affect the ripening season of varieties. Any classification on the basis of the season of ripening therefore must be somewhat general, and the lists given in Table 3 must be so interpreted.

TABLE 3.—*Varieties listed according to season of ripening*

[Abbreviations: eb=Everbearer, em=early to midseason, ml=midseason to late, ve=very early, vl=very late]

Early varieties	Midseason varieties	Late varieties
Blakemore (ve).	Dollar.	Aroma (ml).
Campbell (ve).	Glen Mary.	Belt (ml).
Dunlap (em).	Haverland (em).	Chesapeake.
Excelsior (ve).	Magoon.	Gandy.
Gold Dollar.	Marshall (em).	Joe (ml).
Heflin.	New York.	Late Stevens.
Howard 17 (ve).	Oregon (em).	Mascot (vl).
Klondike.	Parsons.	Nich Ohmer (ml).
Progressive (ve, eb).	Wilson.	Pearl (vl).
Missionary (em).	Williams.	Sample.

EVERBEARING VARIETIES

In Table 3 the Progressive is listed according to the season when it produces its spring crop. It also produces fruit in summer and fall. The Mastodon is a new sort with large berries and better runner production than the other everbearing sorts. Its fruit is not so good in dessert quality as that of Progressive. It also produces a crop during the summer and autumn. Several other everbearing sorts are in the trade, but are not generally so desirable as the Progressive and the Mastodon. Among those grown to a slight extent are the Duluth and the Superb.

NEW VARIETIES

New sorts that are superior to standard ones are introduced occasionally, but most of the introductions are inferior. The number of new varieties that may be introduced can be better realized by reference to Figure 9, which shows beds containing about 15,000 seedlings, each one potentially a distinct variety. The breeder on whose grounds the photograph was taken has raised from 10,000 to 25,000 seedlings annually for many years and tested hundreds under field conditions, but has introduced only a single variety. Other breeders in various parts of the United States are doing similar work. The best of the seedlings are introduced as new varieties, but on extended trial they may develop some weakness that makes them undesirable.

Growers, therefore, should test new varieties before planting them extensively.

When new varieties are tested they should be set by the side of standard sorts and receive similar treatment. If a variety shows itself very susceptible to leaf spot and other diseases it should be discarded after one crop is harvested; if it does not seem susceptible, the test should extend over two or three years, as some seasons are more favorable than others. Furthermore, even in favorable seasons some varieties do not show their true character the first year. A 3-year test, however, will generally indicate the probable value of any new sort.

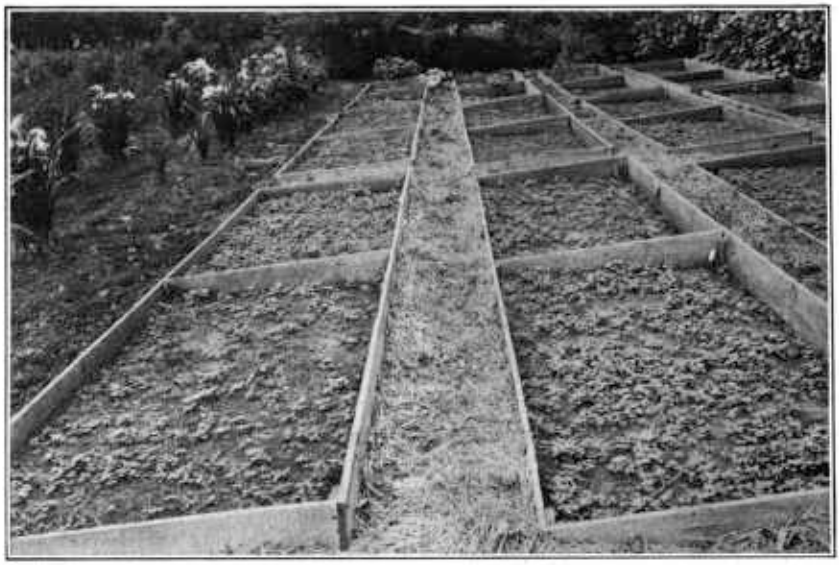

FIGURE 9.—Seed beds filled with seedling strawberry plants. The seed was planted the previous autumn and the beds covered with a straw mulch, which was removed early in the spring. On July 13, when the photograph was taken, about 15,000 seedlings had started, each one of which is potentially a distinct variety

It is not intended in this bulletin to make recommendations regarding new varieties. They must be tested widely in representative sections in order to determine their range of adaptability and relative merit.

RUNNING OUT

It is often asserted in certain sections that a strawberry variety may be very productive for a few years and then "run out," that is, become unproductive. Some sorts are said to run out quickly, in 2 or 3 years, others in about 7 years, while the best run out in about 14 years. A glance at the record of the leading varieties grown at present should help to correct this view.

The Klondike was originated about 1896 and introduced in 1901, while the Aroma appeared in 1889, the Dunlap in 1890, the Gandy in 1885, the Missionary about 1900, the Chesapeake in 1903, the Clark before 1880, the Joe before 1899, the Marshall in 1890, and the Sample in 1894. The Jucunda, a variety grown in Colorado, was introduced

before 1860. The Wilson originated in 1851 and is still grown in some localities. It was at one time grown throughout the United States, but it has been replaced in most sections by varieties more resistant to disease and having larger, firmer berries with milder flavor. Since varieties having larger, firmer, and sweeter berries than the Wilson have been introduced the standards have risen and are continually rising. Unconsciously, old sorts are being judged by new standards, and although they do not seem to be as good as they once were, in reality probably no change has occurred.

Where the yields of certain varieties have decreased markedly within a comparatively few years, various reasons may be assigned. In the South Atlantic, Gulf, and Pacific Coast States, the root-knot nematode has been an important cause of failure. In nearly all sections fungous leaf spots, Botrytis, and to a lesser extent mildew have caused serious loss. New varieties may be comparatively free from these diseases at the time of their introduction, but after a few years may prove so susceptible that they can not be grown profitably. Therefore, although yields from certain sorts may decrease after a few years, even on soils the fertility of which has been maintained, it is probable that some disease factor can be assigned as

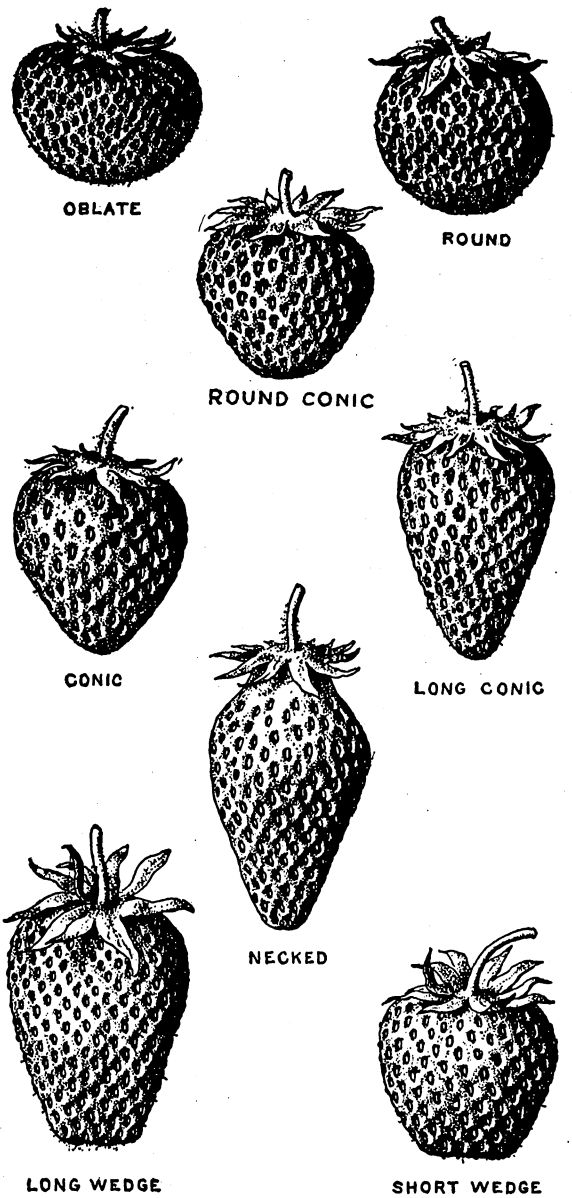

FIGURE 10.—Different forms of strawberries, illustrating certain terms used in describing the varieties. (Drawn by L. C. C. Krieger)

the cause of the reduced yield. Virus or mosaic diseases have caused a decrease in yield in some sections.

In selecting varieties to plant, those resistant to disease should be chosen, and as far as possible they should be selected from plantations relatively free from disease. If the fertility of the soil is maintained, if varieties that are very resistant to disease are set, and if reasonable care is exercised in propagation, no running out in the usual sense of the term is likely to occur.

CHARACTERIZATIONS OF THE MORE IMPORTANT VARIETIES

The following characterizations are intended to aid the prospective strawberry grower in his selection of sorts especially suited to his section and to the purpose for which he wishes to grow them. Only those varieties that are extensively grown in at least one section and promising new sorts that have been widely tested are listed here, and only those characteristics having a bearing on the commercial value of a variety are stated. By using these characterizations in connection with the list of varieties arranged according to States and sections in Table 1, the prospective planter should be able to select desirable sorts for his conditions. The meaning of the terms used in describing the form of berries can be understood by reference to Figure 10. Imperfect varieties have "imp." following their names. All others are perfect.

Aberdeen.—New Jersey origin, about 1909. Berry medium large, conic, regular, attractive, light red, seeds even and regular, white core, fairly soft, mild acid to acid, fair quality; midseason to late; flowers perfect; plants vigorous, makes runners freely. Its productiveness and late season make it worthy of trial for both home and commercial planting. It is too soft for distant shipment.

Aroma.—Kansas origin, 1889. Berry large, round conic to short wedge shaped, firm, bright crimson on surface with light-red flesh, mild subacid, quality good; midseason to late. Foliage very healthy; plants make runners freely. The Aroma is the leading variety in Kentucky, northern Arkansas, and southern Missouri, and is grown extensively in Illinois, Indiana, Michigan, Ohio, and West Virginia. Its chief merits are the disease resistance of its foliage, the productiveness of the plants, and the firmness, high dessert quality, and attractive appearance of the fruit. It is one of the best shipping varieties of the country and is well adapted to the general market requirements. It is best adapted to silt or clay soils.

Belt (*William Belt*).—Ohio origin, about 1888. Berry large, irregular round conic to wedge shaped, soft, attractive dark crimson with dark-red flesh, mild subacid, quality very good to best; season medium late. Foliage only fairly healthy in New England, New York, and other parts of the North, and very susceptible to leaf-spot diseases in New Jersey and southward; plants make runners freely. This variety is widely grown for home use and local markets in New England and New York and to a slight extent in other northern regions. It is liked because of its productiveness and its attractive, dark-red, mild-flavored fruit of best quality. However, it should be planted on fertile soil and receive high cultivation. Fertilizers containing nitrogen should be applied, in order to insure an abundant foliage in the spring to mature the crop.

Blakemore.—Maryland origin, 1923. Berry medium large, blunt conic, firm, bright, light red with light-red flesh, seeds yellow, subacid, quality good; very early; flowers perfect; plants vigorous, makes runners very freely. Its firmness, earliness, and bright light-red color which does not darken on holding make it a promising market sort. Its firmness, ease in capping (hulling), acidity, high pectin content, and light color make it especially desirable for preserving. It is recommended for the region from Georgia to New Jersey and is suggested for trial for the regions where Missionary and Klondike

are grown and in the southern part of the area to which the Howard 17 (*Premier*) is adapted.

Chesapeake.—Maryland origin, 1903. Berry large, round conic to short wedge shaped, firm, bright crimson, with prominent seeds and light-red or whitish flesh, mild subacid, quality good to very good; late in season. Foliage remarkably healthy; plants make few runners except in rich, moist soil. The Chesapeake is the leading variety grown under irrigation in the northeastern United States. It is also raised extensively without irrigation in Maryland, Delaware, and New Jersey, and is very desirable for home use and for market purposes in eastern Missouri and all the northern United States east of the Mississippi. It is liked because of its large, uniform, attractive fruit of excellent dessert and shipping quality and the remarkable freedom of its foliage from diseases and insects. Under irrigation it is one of the most productive of all varieties, and the fruit does not rot as badly as most other sorts.

Clark.—Oregon origin, introduced about 1880. Berries medium size, round to round conic, very firm in Oregon and Washington, dark crimson with dark-red flesh, brisk subacid to acid, quality good; midseason. Foliage healthy in the Northwest, plants make runners quite freely. The Clark is grown only in the Pacific Northwest and is practically the only variety raised in the Hood River and White Salmon regions. It is liked because of its excellent shipping quality and attractive color and because it retains its shape and color well when canned. It is considered the best shipping and canning sort grown in the Northwest, and is recommended for that region. It is not, however, a heavy producer. The color of its foliage under certain conditions suggests mosaic infection, which may be the cause of its low yields.

Dollar.—New Jersey origin; introduced about 1885. Berry large, round conic, firm in the Sacramento Valley of California, attractive red, subacid, quality good; season near Sacramento about three weeks after Jessie. Plants make runners freely. This is a leading variety near Sacramento, Calif., where it is liked because of its very firm fruit and attractive color, and because the plants bear steadily from about April 20 to late summer or fall. It is not grown extensively commercially elsewhere.

Dunlap.—Illinois origin, 1890. Berry medium size, conic, not very firm, dark crimson with deep-red flesh, subacid, quality very good; season early to midseason. Foliage healthy in the North, somewhat susceptible to leaf spot in the Southern States; plants make runners very freely; very hardy and drought resistant. This variety is grown widely in central and northern Illinois, in Wisconsin, Iowa, Minnesota, Nebraska, North Dakota, and South Dakota. It is also widely grown in all other parts of the Northern States east of the Rocky Mountains, and does best on clay soil. The Dunlap is liked because the plants are very hardy and productive, the foliage very healthy, and the berries of very good dessert quality. They are not, however, very good for shipping and are grown chiefly for home use and local markets.

Ettersburg 121.—California origin. Berries small to medium, round, very firm, medium red, rather mild subacid, quality good to very good; midseason to late. Foliage small and subject to leaf spot in Eastern States; plants make runners quite freely. This variety is grown chiefly in western Oregon, where it is considered the best sort for canning. There it succeeds best on certain clay and silt soils and is exceedingly productive. On sandy soils many of its flowers are sterile and it is unsatisfactory. In the Eastern States most of its flowers are sterile, and it is so unproductive that it is not grown.

Gandy.—New Jersey origin, 1885. Berry large, irregular round conic, firm, deep crimson with red flesh, brisk subacid, quality good; season late. Foliage more healthy, as a rule, than that of most sorts, yet somewhat susceptible to mildew, and sometimes attacked by leaf-spot diseases; plants make runners freely. The Gandy is a leading variety in parts of Maryland. Delaware, and New Jersey and is grown throughout the northern United States except in the colder parts of the Middle West. It is liked because of its large, attractive, deep-red, firm fruit, of excellent dessert quality, and because it ripens late, after the season of many others has ended. It is grown for shipping to the general markets and is liked for canning, especially in the home. It does best on moist heavy clay soils. Except on heavy soils, however, it is not very productive, and in some cases it is somewhat susceptible to foliage disease. The berries are apt to decrease in size if a field is fruited more than one year.

Glen Mary (partially imperfect).—Pennsylvania origin; introduced in 1896. Berry large, irregular round conic, rather soft medium, deep crimson with red flesh, often with white tips, subacid, quality good; midseason. Fruit stems too slender to hold fruit off the ground. Foliage susceptible to leaf spot; plants make runners freely; best adapted to heavy soils. The Glen Mary is grown extensively in New York and New England and in some other parts of the northern United States. It is liked because it is exceedingly productive and the fruit is deep red in color. The plants, however, must receive high culture in order to produce berries of good size. The foliage is very susceptible to leaf spot, and for this reason it is grown very little south of New Jersey on the Atlantic coast. Even in the New England States and New York growers consider it desirable to use large quantities of stable manure in late autumn or nitrate of soda in early spring in order to force a rapid spring growth of leaves; otherwise, the foliage may be so badly damaged by leaf spot that not enough remains to mature a crop. The blossoms are not entirely self-fertile, and some other variety, such as the Dunlap, should be planted with it to furnish pollen. The berries often have white tips when they are otherwise ripe and ready to pick.

Gold Dollar.—Oregon origin; introduced about 1906. Berry medium to large, round conic, soft to fairly firm, dark crimson, flesh red to center, subacid, quality good; season early. Plants make runners freely. The Gold Dollar is grown somewhat in Oregon and in the Puget Sound region of Washington, where it is considered one of the best early varieties.

Heflin.—North Carolina origin; introduced about 1902. Grown extensively in Eastern Shore section of Virginia. Very early, berries light red, subacid, fair quality, but too soft and flesh color too light. Berries normally long conic, but early berries very irregular in shape.

Howard 17 (*Premier*).—Massachusetts origin; introduced as Howard 17 in 1918. Berry medium to large, long conic, fairly firm, red with red flesh, subacid, quality very good; very early with long season. Foliage very healthy; plants generally make runners freely. It is now one of the leading varieties in New England southward to Virginia and westward to Illinois and Michigan. Although it has only recently become well known, it is one of the best sorts for home use and local markets east of the Mississippi and north of Virginia and the Ohio River. It should also be tried in Missouri, Kentucky, and the western part of Virginia. It is liked because of its exceptionally healthy foliage and its productiveness. It does well on a wide range of soil types. The fruit is probably not firm enough to ship to distant markets, though it is shipped extensively from Maryland to northern markets.

Joe (*Big Joe*).—New Jersey origin; introduced in 1899. Berry large, round conic, firm, dark crimson with red flesh, subacid, quality good to very good; midseason to late. Foliage healthy; plants make runners freely on good soil. This variety is extensively grown in Maryland, New Jersey, Delaware, and Pennsylvania. It is also grown to a less extent in all parts of the northern United States except in parts of the Middle West having very severe winters. It is liked because of its large attractive berries, which are very good shippers and of good dessert quality. The Joe is liked by many as well as the Chesapeake for intensive culture, and because it makes rather more plants than that variety it is sometimes more desirable.

Klondike.—Louisiana origin, about 1896. Berry medium size, round or round conic (except in California, where it is necked), very firm, deep crimson to center, acid, quality fair to good; midseason. Foliage healthy; plants make runners freely. The Klondike is grown almost exclusively in all parts of the South Atlantic and Gulf Coast States except in central Florida, in certain parts of North Carolina and West Virginia, and in the Cullman region of Alabama. It is also grown extensively in southern California and in Arkansas and southern Illinois. It is liked because its foliage is resistant to leaf spot (though not to leaf scorch), and its fruit firm and deep crimson in color. It is one of the best shipping varieties in the United States and is especially adapted to market purposes. Because of its deep-red color and firm flesh, it is well liked for barreling for the ice-cream trade and is one of the best varieties for this purpose. The hulls, however, do not separate easily, and in Delaware and Maryland the berries are small after the first few pickings.

Lupton.—New Jersey origin; introduced about 1915. Berry large, short wedge shaped, variable, often double; firm, very showy; quality poor; midseason. Foliage resembles the Chesapeake, but is quite susceptible to leaf spot. Plants

make runners freely. Best adapted to low ground like that on which the Gandy does best. The Lupton is being grown somewhat in southern New Jersey. It is liked because of its remarkably handsome fruit, which is considered to have good shipping quality; on the Philadelphia and Boston markets it has commanded fancy prices. The berries, however, have coarse, dry flesh which makes them low in dessert quality.

Magoon.—Oregon origin; introduced in 1894. Berry medium to large, irregular round conic, soft, attractive dark crimson with dark-red flesh, mild subacid, quality good; midseason. Makes plants freely. The Magoon is grown to some extent in the Willamette Valley of Oregon and in western Washington; it is very productive there, and is liked for home use and local market. The fruit, however, is too soft for shipping.

Marshall.—Massachusetts origin, 1890. Berry large, irregular round conic to conic, soft, deep crimson with dark-red flesh, subacid, quality best; early to midseason. Foliage fairly healthy in New England and New York, but too susceptible to leaf spot farther south to be desirable; plants make runners freely; especially adapted to heavy soils. The Marshall is the standard of excellence in dessert quality and is grown chiefly because of this and because, under the most intensive garden culture, it produces large crops of handsome berries. It seems necessary even in New England and New York to grow it on rich soil and to fertilize it heavily in the autumn with stable manure or in the spring with nitrate of soda in order to force a rapid growth of foliage; otherwise, the leaf-spot diseases frequently injure it so severely that the fruit does not develop. In southern New Jersey and regions of similar or more southern latitudes the Marshall is not considered desirable because it is very susceptible to leaf spot and because the berries are small after the first few pickings. It is the leading variety in California and one of the most important in Oregon and Washington. In California it fruits throughout the summer and is exceedingly productive. In Oregon and Washington it is grown extensively for the preserving trade.

Mastodon.—Indiana origin, 1917; introduced in 1924. Berry large to very large; round conic, with sides sometimes slightly furrowed; medium dark scarlet red, very attractive; flesh firm, subacid, fair quality; seeds bright yellow. Plant develops a number of crowns and is a good plant maker for an everbearing variety. It is hardy and productive in all strawberry regions where there is enough rainfall to develop the berries. It is rapidly taking the place of Progressive as the leading everbearing variety in Eastern States. It is too soft for shipment during rainy periods and not of high quality.

Missionary.—Virginia origin, about 1900. Berry below medium size to large, conic, soft to very firm according to the section in which it is grown, dark crimson with dark-red flesh, acid, quality fair to good; early to midseason. Foliage very resistant to leaf spot; makes runners freely. This variety is the standard sort for Florida and is grown extensively in the eastern part of North Carolina, in the Norfolk district of Virginia, and in some parts of eastern Maryland. The berry, however, is softer than the Klondike in North Carolina, Virginia, and Maryland, but is more productive. In central Florida the berry is very firm, and excellent for shipping. It begins to ripen there in December or January and continues until April at least. Because of its long ripening season, its firm, attractive fruit, and the freedom of its foliage from leaf spot, it is considered more desirable than any other sort for that region.

New York.—New York origin, 1890. Berries large to very large, irregular, crimson with red flesh, soft to firm, mild subacid, quality very good; midseason. Foliage healthy in the Northeast; plants make runners freely. This variety has been widely grown in the Northeastern States because of its large sweet fruit, which can be eaten by many who can not eat the more acid fruit of most sorts. The New York is sold under other names, though there may be other varieties sold under the same name. There are several varieties in the trade which are very similar, and probably some of them are identical with the New York. These include the Otto, Fairdale Giant, Morgan, Oswego, Pocahontas, Roosevelt, Ryckman, Maximus, Big Perry, Armstrong, Hummer, Uncle Jim, and others.

Oregon (*Banner*).—Oregon origin, about 1898. Berry medium to large, round conic to conic, fairly firm, dark crimson with lighter red flesh, mild subacid, quality good to very good; early to midseason. Plants make runners freely. The Oregon is grown chiefly in the Pacific Northwest and in the vicinity of San Francisco, Calif.; it is considered desirable for home use and for markets because of the productiveness of the plants and its large attractive berries of

excellent quality. It is similar to the Marshall, which is apparently often planted and called the Oregon.

Parsons (*Parsons Beauty, Gibson, Pocomoke*).—Maryland origin, about 1890. Berry medium to large, irregular conic to wedge shaped, soft, bright crimson with red flesh, brisk, subacid, quality fair to good; midseason. Foliage somewhat susceptible to leaf spot; plants make runners freely. This variety is grown chiefly for canneries, and is liked very well for this purpose. The plants are productive; the fruit retains its shape fairly well after cooking; the hull removes easily; and the flesh is red and has a brisk subacid flavor. The Parsons is grown chiefly in Delaware, Maryland, western New York, and western Michigan. It is usually advantageous to use stable manure late in the autumn on plantations of this variety in order to induce a vigorous foliage growth early in the spring.

Premier.—Introduced in 1915. A synonym of Howard 17. See the description of that variety.

Progressive.—Iowa origin, 1908. Berry small to medium size, conic, soft to moderately firm, dark crimson with dark-red flesh, subacid, quality good to very good; an everbearer, season early, fruiting until hard frosts in autumn. Foliage healthy and one of the most resistant of all to leaf-spot diseases; plants make runners freely on rich ground. The Progressive is the most widely grown of the everbearing strawberries. It is liked because of its hardiness, its resistance to leaf-spot diseases, its excellent dark-red fruit, and also because if planted in early spring it yields a considerable quantity of fruit the same year. It is especially adapted to home gardens and intensive culture on rich soil amply supplied with moisture. It is adapted to regions north of those in which the Klondike succeeds, but has not been found adapted to the South.

Sample (imp.).—Massachusetts origin, 1894. Berry large, conic to long conic, soft to medium firm, dark crimson with red flesh, subacid, quality good; season late. Foliage usually healthy in the North, affected by leaf spot in southern New Jersey and southward; plants make runners freely. The Sample is grown extensively in New England and New York and to some extent in Pennsylvania, Ohio, Michigan, Indiana, and Illinois. It is liked because of its productiveness and its large, uniform, attractive, dark-red fruit. The berries, however, are somewhat soft for shipping; it is especially adapted to home gardens and the local market. It is commonly pollinated with Dunlap and other varieties of the same season.

Wilson.—New York origin, 1851. Berry medium size, round conic, soft to firm, dark crimson, with dark-red flesh, brisk subacid flavor, quality good; medium early. Foliage fairly healthy in New York; plants make runners freely. The Wilson was formerly grown extensively in nearly all parts of the United States, but is now planted very little except in western New York, near Rochester, and in the States of Oregon and Washington. It is liked because of its extreme productiveness on fertile soils and its dark-red acid fruit of good quality, which is used almost entirely for canning. It should be grown on fertile soils containing a good supply of nitrogen, which will force a vigorous growth of the foliage.

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